RECENT LITERATURE.

Dall on Dynamic Influences in Evolution.[1]—In this interesting paper we find that Mr. Dall turns to mechanical influences of environment as an essential factor in evolution.

It is generally admitted, he says, that in natural selection we have a theory which accounts for the perpetuation of favorable, and the elimination, in the long run, of unfavorable variations in organic beings. It is equally admitted that the origin of variation is not accounted for by this theory. To round out our conception of the mode of evolution it is necessary that this deficiency should be supplied. It should also be supplemented by some conception of the mode by which variation is sustained in a given direction until it has reached a point of usefulness sufficiently marked to enable the selective process to operate.

He accepts the relation of the organism to its environment as the desired factor, and for this adopt the name of Dynamic Influences. He maintains that acquired characteristics are inherited. The organism suffers during its entire existence a continuous series of mechanical impacts, none the less real because invisible. Since individual organisms usually appear free to wander or remain quiescent, the idea that they are under constant stress does not ordinarily suggest itself, and to this fact he ascribes the slowness with which the dynamic element in evolution has received recognition. The characters developed in an organism in response to impacts are acquired, but that which is transmitted is a facility of response in the same line. This, under favorable conditions and a series of generations subjected to similar impacts, may promote and establish the physiological habit, which is the directive influence towards the development of the characters in question.

The dynamics of environment vary within comparatively narrow limits, when consistent with organic existence. On the other hand, owing to the narrowness of the limits, the dynamic variations to which organic forms are subjected become relatively more important. It is probable that no two organisms have ever been subjected to exactly the same dynamic influences during their development. Differences of impact necessarily imply differences of response, hence variation is inevitable. The origin of variation, therefore, presents no difficulties.

[1] Read before the Biological Society of Washington, March 8, 1890, by Wm. H. Dall.

The question is, How are the small necessary and admitted differences stimulated to develop into the obvious differences recognized by systematic biologists? To this he answers that the reactions of the organism against the physical forces and mechanical properties of its environment are abundantly sufficient, if we are granted a simple organism, with a tendency to grow, time for the operation of forces, and the principle of the survival of the fittest.

It is often assumed that the possibility of variation is equal in every direction. A consideration of the dynamic conditions of life shows that this is not the case. Under conditions which would permit it, resulting organic forms would be sub-spherical, and would have to pass their entire existence in constant rotation. The moment one of them came to rest, it would be subjected to unequal stresses. Light, gravity, nutrition, etc., would be unequally distributed, forcing an unequal growth and specialization of regions. Inequality established, locomotion, with attendant friction and resistance, would confirm the inequality. Organic matter, as such, is in no sense released from the servitude of matter to the operation of physical forces.

Mr. Dall divides the operation of biologic selection into two categories: 1st, That in which fitness and unfitness are determined by the perfection in adjustment of the individual to the mechanics of the environment; 2d, That in which intelligence becomes a factor. The latter includes sexual selection, mimicry, protective coloration, etc. It is not necessary that the organism which is modified should possess even consciousness; but one of the two parties to the modification must possess intelligence of a certain grade. It is probable that influences of the second category operate more rapidly and produce greater diversity in development than could have been expected from the working of purely physical forces.

If the dynamic evolutionist brings forward an hypothesis which explains the facts of nature without violence to sound reasoning, that hypothesis is entitled to respect and consideration until some better one is proposed, or until some vitiating error is detected in it. For the dynamic hypothesis only those characters can be considered which arise from permanent physiological reactions due to the impact of external forces. Mutilations rarely fall into this category, and are essentially sporadic. A pathologic incident may affect the progeny, but only in trifling numbers, and it is of no importance to the dynamic hypothesis whether it can be proven or not. The forces invoked by dynamic hypothesis, on the other hand, affect every individual of a race and every generation as long as the environment continues unchanged.

It seems to the writer that Mr. Dall has not given the full value to pathologic cases. These may result from unfavorable surroundings; or at the close of the natural life of a species or group, pathologic changes may be taken on, as clearly shown by Prof. Hyatt in fossil Cephalopods. In these cases, all the individuals of a race and successive generations in a given locality or geological horizon may be induced to take on features of a pathologic character, and form a degradational series of individuals, species, or genera.

In studies of the development of the hinge of Pelecypods, and the columellar plaits of Voluta, Mitra, and other Gastropods, Mr. Dall gives concrete examples of dynamical genesis. These appeal strongly in in favor of this hypothesis, on account of the simplicity of the problem as he presents it, and the complete way in which the facts illustrate the mechanical stresses to which the parts have been exposed.

Mr. Dall's paper suggests to me what I believe is a new way in which to consider natural selection in its relation to dynamic influences. In their mutual relation it is clear that natural selection is not a new force coming in where dynamic influences cease; but rather it comes as a corollary of dynamic influences. It is not a foreign force, acting in some other and special way; but it acts in harmony with, and as a natural outcome of dynamic influences. If dynamic forces tend to push a series of organisms in any given time of variation, some individuals will evidently be pushed further on that line of variation than other individuals, on account of greater plasticity or other causes. Those which have yielded most fully to the acting forces will be as a necessity more completely in harmony with the mechanical requirements of the environment; therefore they will be more likely to successfully propagate and hand down the modified features which fit them for the environment, and have been fitted on to them by the environment. That such individuals will propagate especially freely may be legitimately inferred from the well-known principle, that complete harmony with environment is one of the prime factors in the successful reproduction of animals and plants. Such especially well-fitted individuals are not exceptional and sporadic cases; they are in direct accord with the ascendant line of the series to which they belong, and would therefore be naturally selected because they have most completely filled the mechanical requirements of their environment. During successive generations individual advantages naturally selected on this principle will not tend to become merged and lost sight of in the general average; they will tend to elevate and bring into greater perfection of equilibrium the oncoming generations.

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